REMARKS/ARGUMENTS

STATUS OF THE APPLICATION

Claims 1 to 21 are the claims of record in the application. Claims 1 to 6, 8, 10, and 14 to 18 have been rejected. Claims 7, 9, 11, 12 and 19 are objected to. Claims 13 and 21 have been allowed. Applicants have added new claims 22-25 that are directed to further aspects of the present invention.

AMENDMENTS TO THE CLAIMS

The Applicants have amended the claims to improve clarity and reduce the small probability of confusion for the skilled artisan. None of these amendments have been made for reasons of patentability.

OBJECTIONS TO THE CLAIMS

In paragraph 3 of the Office Action, the Examiner has objected to claims 1, 6, 11, 13, 14, 18 and 21 on the basis of minor informalities. The Applicants thank the Examiner for pointing these out and they have been corrected in the enclosed claim amendments in accordance with the Examiner's suggestions in all cases.

CLAIM REJECTIONS – 35 USC § 103

In paragraph 5 of the Office Action, claims 1 to 6, 8, 10, and 14 to 18 have been rejected under 35 USC § 103 as being unpatentable over U.S. Patent 6,766,081 to Weaver et al., hereafter referred to as Weaver.

Description of Weaver and of Applicants' Invention

Weaver is directed to manipulation of an optical signal emitting from an optical source, the optical signal containing a plurality of wavelength "bands" – namely the designated standard 100 GHz wavelength channels of the International Telecommunications Union (ITU) standardized grid corresponding to a plurality of wavelength bands each of approximately 0.8 nm in width. Weaver spatially separates the wavelength bands using a dispersive element and then

manipulates the path difference of the individual wavelength bands using a focusing element suitably disposed so as to compensate for the dispersion in the focusing distance of the focusing element and thereby to the flatten the focal field of the optical system. This is done to ensure that each of the spatially separated beams is focused onto a desired optical element in a substantially planar array of such optical elements – essentially focusing each of the spatially separated wavelength bands onto the face of a designated optical output port selected from a plurality of such ports in a planer array configuration. The "first focusing element" which is described in Weaver is an aberration correction lens to optimize the performance through compensation of the effect of focal plane curvature. As such, this optical system will tend to maintain the original circular optical intensity profile that would otherwise be distorted for some wavelengths by defocusing. For MEMS mirror applications, or other applications involving physical steering of beams, where the aim is to reduce the individual mirror size according to each spectral band for physical stability, a small close-to-circular optical intensity profile can be advantageous.

In contrast, in applications involving manipulation of phase elements it is advantageous to have many pixels available within the optical intensity profile in the axis which is being redirected (the x-axis in the Applicant's invention) to allow high extinction to be achieved in spite of being limited by discrete phase steps as discussed below.

The Applicants' invention is directed to manipulation of individual wavelength channels contained in an optical signal by angularly dispersing the wavelength channels into angularly dispersed wavelength signals, focusing the angularly dispersed wavelength signals in the dimension of the angular dispersion **only** (unlike Weaver, the beams remain collimated in the switching axis with a 1/e^2 optical intensity diameter of approximately 3 mm) such that each wavelength signal is imaged into a series of **elongate spatially separated wavelength signals** onto a spatial manipulation element (SME) which subsequently manipulates in a complex manner each of the elongate spatially separated wavelength signals individually (please refer to Figure 1 attached). Note that claim 1 has been amended to remove the reference to "wavelength bands" to improve the clarity of the claim and avoid the small probability of confusion with the definition of "wavelength bands" as used in Weaver. Similarly, independent claim 14 has also

been amended to clarify the elongation of the image of the wavelength components. These claim amendments are merely intended to clarify the fact that the elongation of the wavelength signals is directed to the optical intensity profile of the focused image rather than the group of wavelengths defining each wavelength channel and not for any reason regarding the patentability of the claim.

The Rejection of Independent Claims 1 and 14

It is respectfully submitted that the Examiner has neglected to consider the limitation in claim 1 of the present application that the optical power element focuses the "angularly dispersed wavelength signals into a series of **elongated** spatially separated wavelength bands" (note claim terminology prior to amendment contained herein). The flattened focal plane of Weaver is not the same as elongating the optical intensity profile of the focused image and Weaver does not teach or reasonably suggest elongation of the spatially separated wavelength bands.

The advantage of the elongated image in the focal plane of the optical power element onto the SME is that it enables complex diffraction patterns to be created using the SME to be able to manipulate the properties of the light falling on a particular region of the SME. The matched elongated regions of the SME that accept the elongated spatially separated wavelength signals provide a large number of individual pixels in the dimension perpendicular to the dispersion dimension (referred to in the specification as the x-dimension) which enables the diffraction patterns to be extremely complex in the x-dimension for manipulation of the wavelength signals. The complex diffraction patterns provide a supremely superior amount of control over the properties of the wavelength signals in the x-dimension, which is used for example for routing and attenuation of the elongate spatially dispersed wavelength signals. Using this method of manipulation the current devices constructed in accordance with the preferred embodiments of the invention have been able to achieve extinction ratios between each of the respective output ports of the device well in excess of 40 dB in addition to having high extinction between neighboring wavelength channels, again in excess of 40 dB (please refer to attached Figures 2 and 3 for actual data taken from the Applicants' invention). Although small

mechanical steering devices (for example MEMS systems) may achieve similar specifications they are susceptible to mechanical vibration and shock and require complicated and expensive feedback mechanisms to control the steering of the individual mirrors - problems that are reduced by the use of voltage controllable phase arrays as described in the Applicant's application.

In contrast, the device of Weaver does not possess these advantages and does not reasonably suggest or teach that elongation of the image of the focused angularly separated wavelength beams is advantageous for any purpose. Therefore, Weaver does not suggest the desirability of the invention claimed by the Applicants and it is respectfully submitted that the rejection be reversed and the claim allowed.

Furthermore, the Examiner has also asserted on page 3 line 21 of the Office Action that it would be obvious to the skilled artisan to employ a cylindrical lens for the purpose of flattening the focal field. The applicant respectfully submits that the use of cylindrical lenses and mirrors in the Applicant's application is for the purposes of creating a highly asymmetric beam profile at the phase matrix . As the examiner has noted, the flattening of focal field (in the one dimension that is focused) could be achieved with the addition of a correction cylindrical lens (or by using a primary lens having an acylindrical component), however the Applicants' design is inherently tolerant of non-flat focal plane because of the arrangement of the surrounding optical elements in the preferred embodiments of the present invention (i.e. the use of low numerical aperture optics of a GRISM (grating-prism pair) rather than a typical grating. As such, the Applicants' perform no explicit flattening of the optical field other than standard parameter optimization techniques.

Furthermore, the substitution of the focusing element of Weaver with a cylindrical lens would render the preferred embodiments of Weaver unsatisfactory for its intended purpose of efficient coupling of the angularly dispersed beams to respective ones of the array of optical fiber output ports.

It is respectfully requested that the rejection of claim 1 be reversed and the claim allowed over the prior art of record.

Rejection of Independent Claim 14

The above arguments regarding the rejection of claim 1 are incorporated herein by reference as also being applicable to claim 14. Weaver does not disclose or reasonably suggest the elongation of the image of the angularly dispersed beams in the focal plane of the focusing element. Amendment of the claim to clarify this point is incorporated herein.

Accordingly, it is respectfully submitted that the rejection of claim 14 be reversed and the claim allowed over the prior art of record.

Rejection of the Dependent Claims

In view of the arguments presented above that Weaver does not reasonably suggest the Applicants' claimed invention, the rejections of the dependent claims 2 to 12, each deriving dependence from claim 1 and claims 15 to 20 deriving dependence from claim 14 are believed overcome.

SUMMARY

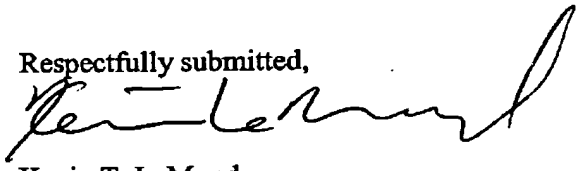
The Applicants believe that all of the Examiner's rejections have been overcome with respect to all the claims 1 to 12 and 14 to 20 (as amended) and that the claims are allowable.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 415-576-0200.

Respectfully submitted,



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Attachments
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